HICET

IBM PROJECT DOCUMENTS

TEAM-8

Project Title

Energy Consumption Analysis

- Analyze energy consumption data (e.g., electricity usage, gas consumption) for residential or commercial buildings
- Visualize energy usage patterns over time using line charts or area charts.
- Create bar charts to compare energy consumption across different buildings or sectors

Team Number & Teammates:

TEAM-8

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Description About the project

Energy consumption analysis involves the examination of energy usage patterns and trends in residential or commercial buildings. This analysis typically focuses on key energy sources such as electricity and gas. By analyzing energy consumption data, valuable insights can be gained into the efficiency of energy usage, seasonal variations, and opportunities for optimization or conservation

Following steps

Data Collection: Energy consumption data is collected from various sources such as utility bills, smart meters, or IoT devices installed within buildings. This data includes measurements of electricity usage, gas consumption, and potentially other forms of energy consumption relevant to the specific building or sector.

Data Preparation: The collected data undergoes cleaning and preprocessing to ensure accuracy and consistency. This involves handling missing values, correcting outliers, and standardizing units and formats as necessary.

Time-Series Analysis: Time-series analysis is conducted to visualize energy usage patterns over time. Line charts or area charts are commonly used for this purpose, with time represented on the x-axis and energy consumption on the y-axis. These visualizations allow for the identification of trends, seasonal variations, and any anomalies in energy usage.

Comparative Analysis: Bar charts are employed to compare energy consumption across different buildings or sectors. Each bar represents the total energy consumption for a specific entity, allowing for easy comparison between them. This analysis can reveal disparities in energy usage and highlight areas for improvement or further investigation.

Insights and Interpretation: The visualizations generated from the analysis are interpreted to extract insights into energy consumption patterns and trends. Factors influencing energy usage, such as building occupancy, weather conditions, or changes in energy efficiency measures, are considered. These insights inform recommendations for energy conservation, optimization, or efficiency improvements.

Visualization Tools: Various data visualization tools and libraries, such as Matplotlib, Seaborn, and Plotly, Microsoft Excel, or Tableau, are utilized to create the charts and visualizations needed for energy consumption analysis.

Overall, energy consumption analysis provides valuable insights into the efficiency and patterns of energy usage in residential or commercial buildings,

helping stakeholders make informed decisions regarding energy management and conservation.

Code and Output

imported packages:

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import folium
```

Data sets:

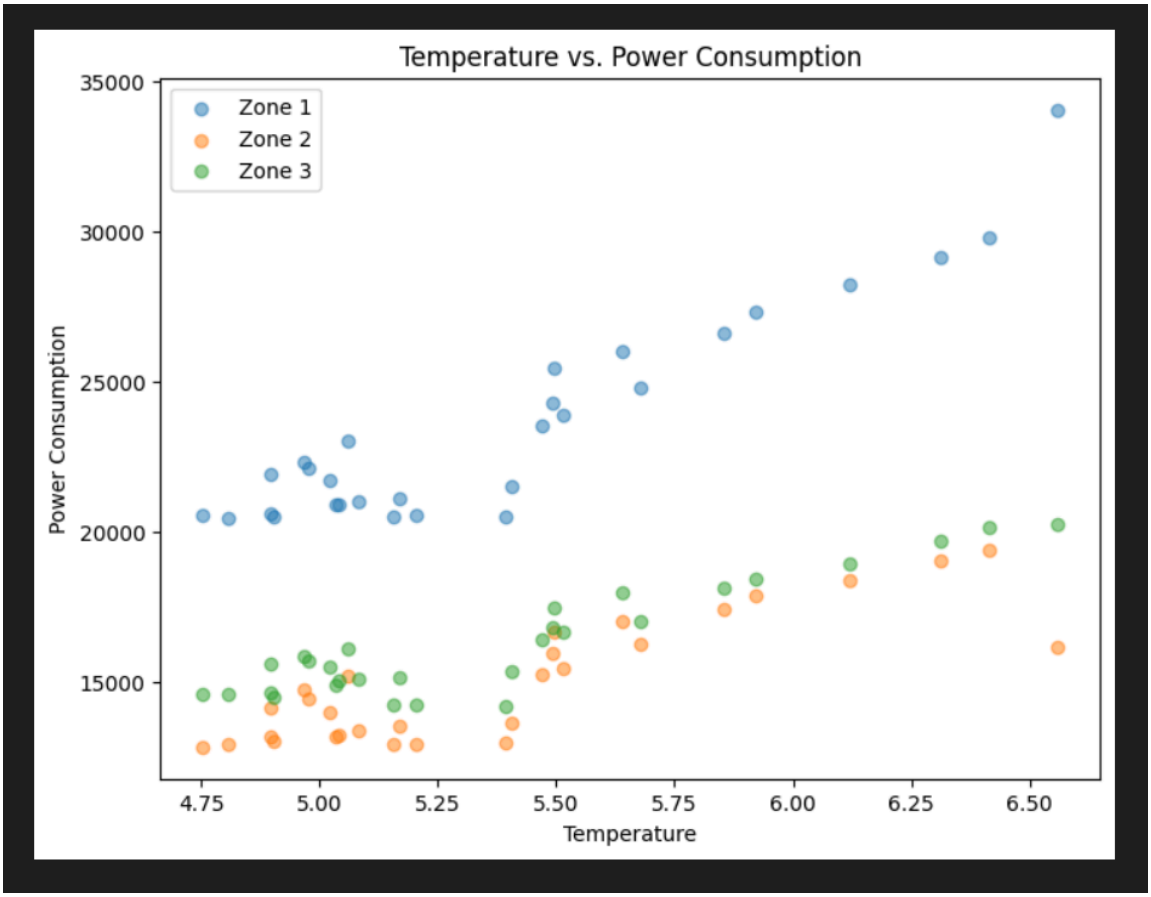
```
#read the csv file
data=pd.read_csv('D:\Dataset\kavi.csv')
print(data)
```

	Temperature	Humidity	WindSpeed	GeneralDiffuseFlows	DiffuseFlows	\
0	6.559	73.8	0.083	0.051	0.119	
1	6.414	74.5	0.083	0.070	0.085	
2	6.313	74.5	0.080	0.062	0.100	
3	6.121	75.0	0.083	0.091	0.096	
4	5.921	75.7	0.081	0.048	0.085	
5	5.853	76.9	0.081	0.059	0.108	
6	5.641	77.7	0.080	0.048	0.096	
7	5.496	78.2	0.085	0.055	0.093	
8	5.678	78.1	0.081	0.066	0.141	
9	5.491	77.3	0.082	0.062	0.111	
10	5.516	77.5	0.081	0.051	0.108	
11	5.471	76.7	0.083	0.059	0.126	
12	5.059	78.6	0.081	0.070	0.096	
13	4.968	78.8	0.084	0.070	0.134	
14	4.975	78.9	0.083	0.055	0.152	
15	4.897	79.1	0.083	0.070	0.096	
16	5.020	79.7	0.081	0.051	0.134	
17	5.407	78.5	0.082	0.062	0.163	
18	5.169	77.9	0.083	0.066	0.108	
19	5.081	77.7	0.084	0.051	0.130	
20	5.041	77.2	0.081	0.062	0.152	
21	5.034	76.9	0.083	0.051	0.185	
22	4.896	76.6	0.085	0.070	0.137	
23	4.805	76.2	0.081	0.059	0.134	

Scatter plot:

```
#SCATTER PLOT
plt.figure(figsize=(8, 6))
plt.scatter(data['Temperature'], data['PowerConsumption_Zone1'], alpha=0.5, label='Zone 1')
plt.scatter(data['Temperature'], data['PowerConsumption_Zone2'], alpha=0.5, label='Zone 2')
plt.scatter(data['Temperature'], data['PowerConsumption_Zone3'], alpha=0.5, label='Zone 3')
plt.title('Temperature vs. Power Consumption')
plt.xlabel('Temperature')
plt.ylabel('Power Consumption')
plt.legend()
plt.show()
```

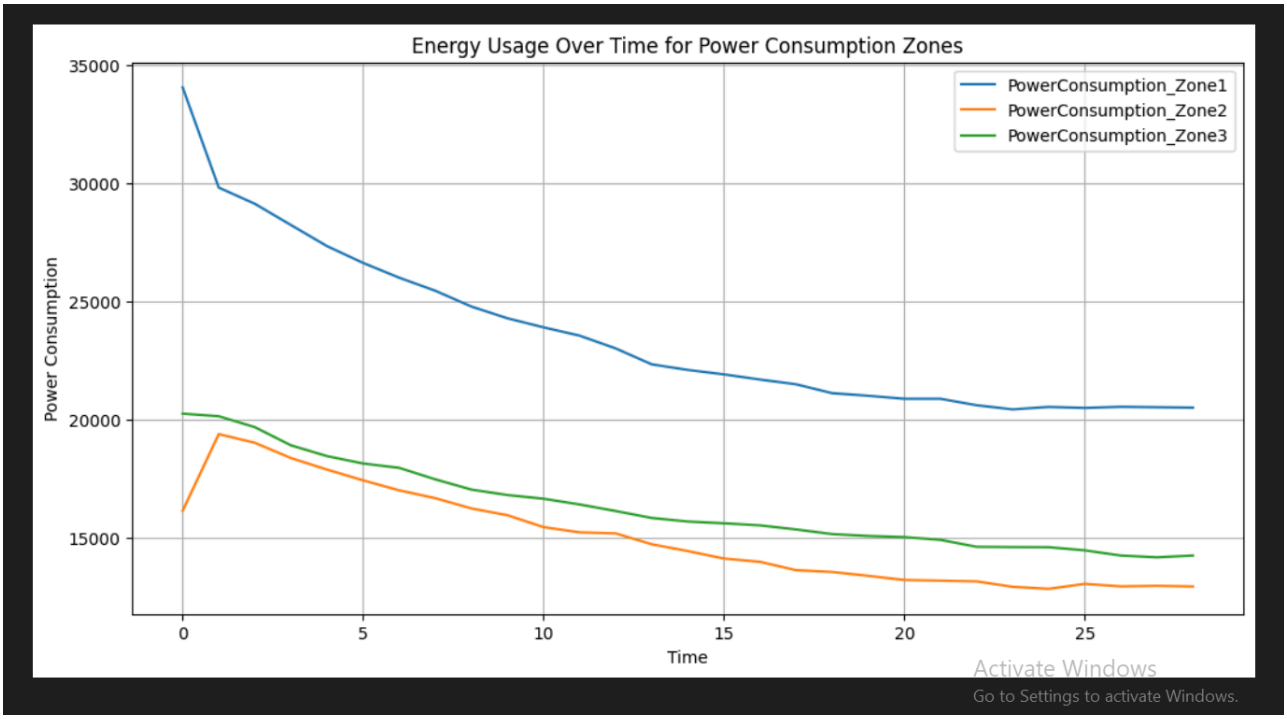
output:



Line chart:

```python
# Plot energy usage over time for Power Consumption Zones
plt.figure(figsize=(12, 6))
for zone in ['PowerConsumption_Zone1', 'PowerConsumption_Zone2', 'PowerConsumption_Zone3']:
    plt.plot(data.index, data[zone], label=zone)

plt.title('Energy Usage Over Time for Power Consumption Zones')
plt.xlabel('Time')
plt.ylabel('Power Consumption')
plt.grid(True)
plt.legend()
plt.show()
```

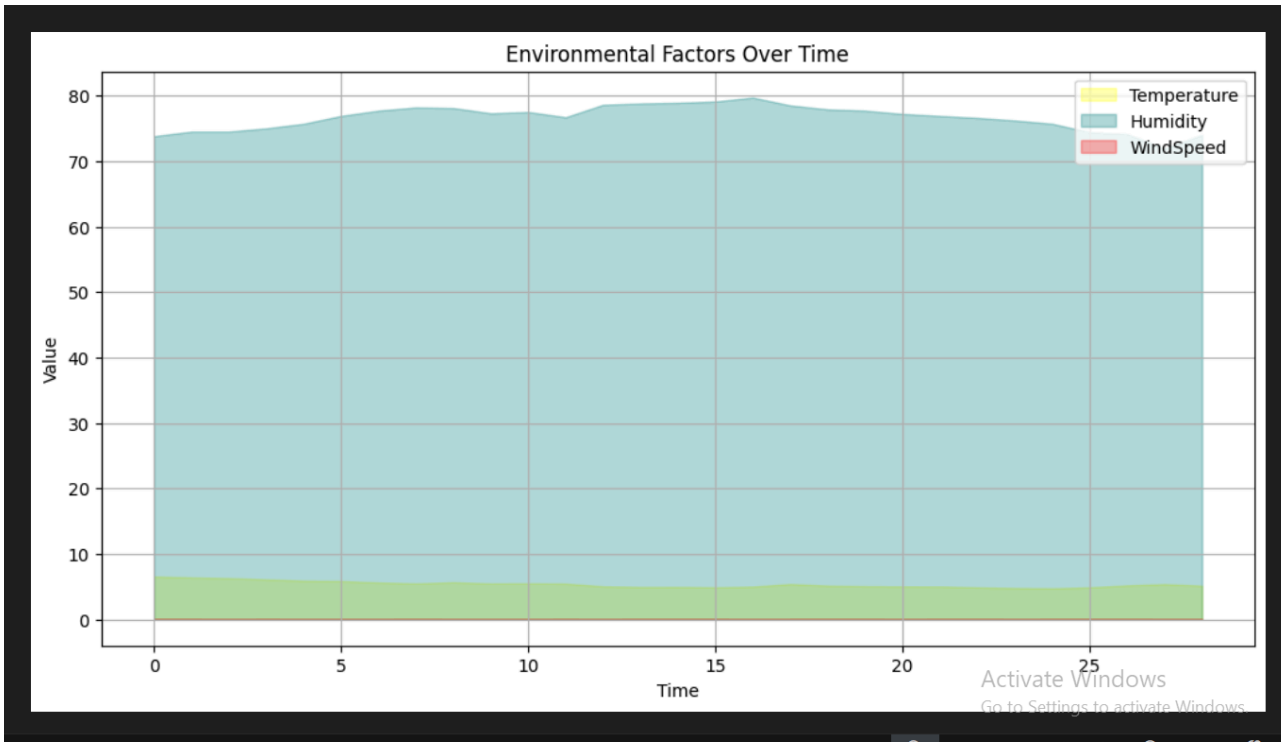

Output:



Area chart:

```python
# Plot environmental factors (Temperature, Humidity, WindSpeed) over time using an area chart
plt.figure(figsize=(12, 6))
plt.fill_between(data.index, data['Temperature'], color='yellow', alpha=0.3, label='Temperature')
plt.fill_between(data.index, data['Humidity'], color='teal', alpha=0.3, label='Humidity')
plt.fill_between(data.index, data['WindSpeed'], color='red', alpha=0.3, label='WindSpeed')

plt.title('Environmental Factors Over Time')
plt.xlabel('Time')
plt.ylabel('Value')
plt.grid(True)
plt.legend()
plt.show()
```

Output:

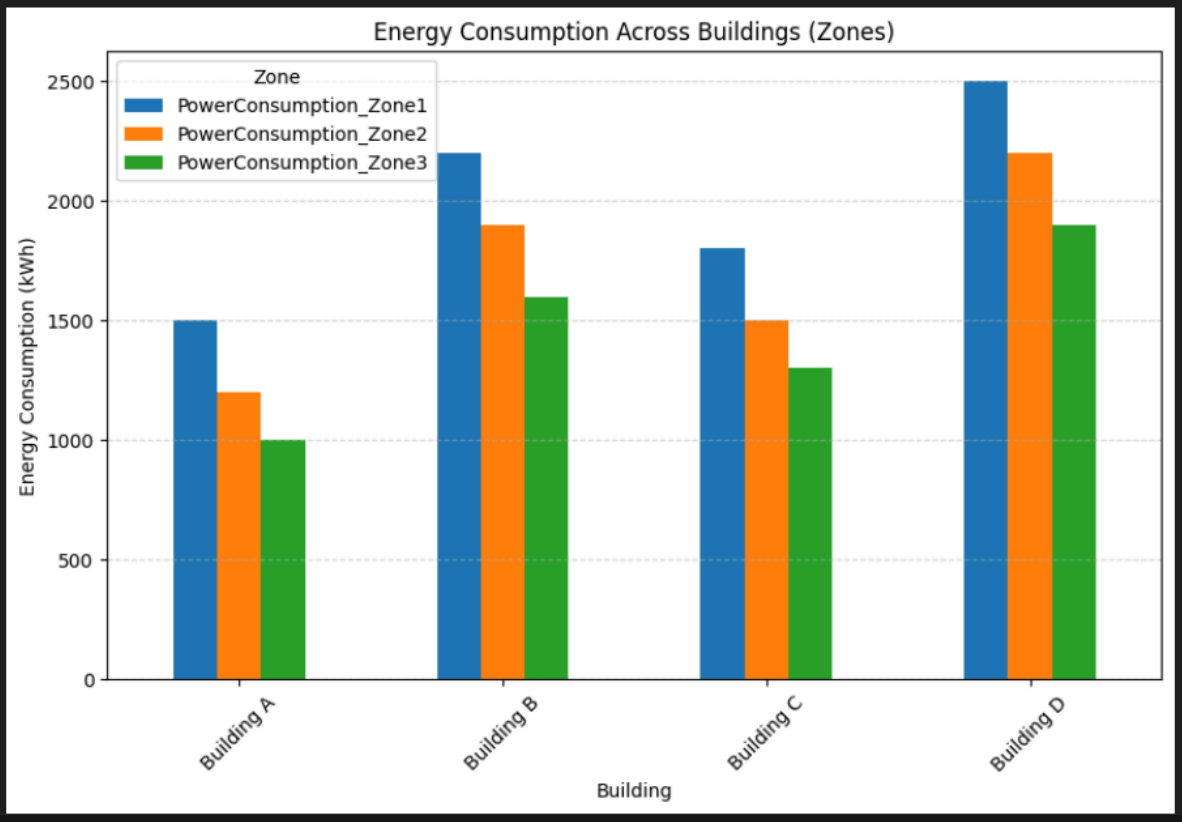


Bar chart:

```
# Plotting a bar chart for energy consumption across buildings (Zones)
df.plot(kind='bar', figsize=(10, 6))
plt.title('Energy Consumption Across Buildings (Zones)')
plt.xlabel('Building')
plt.ylabel('Energy Consumption (kWh)')
plt.xticks(rotation=45)  # Rotate x-axis labels for better visibility
plt.legend(title='Zone')
plt.grid(axis='y', linestyle='--', alpha=0.5)  # Add gridlines for y-axis
plt.show()
```

Output:

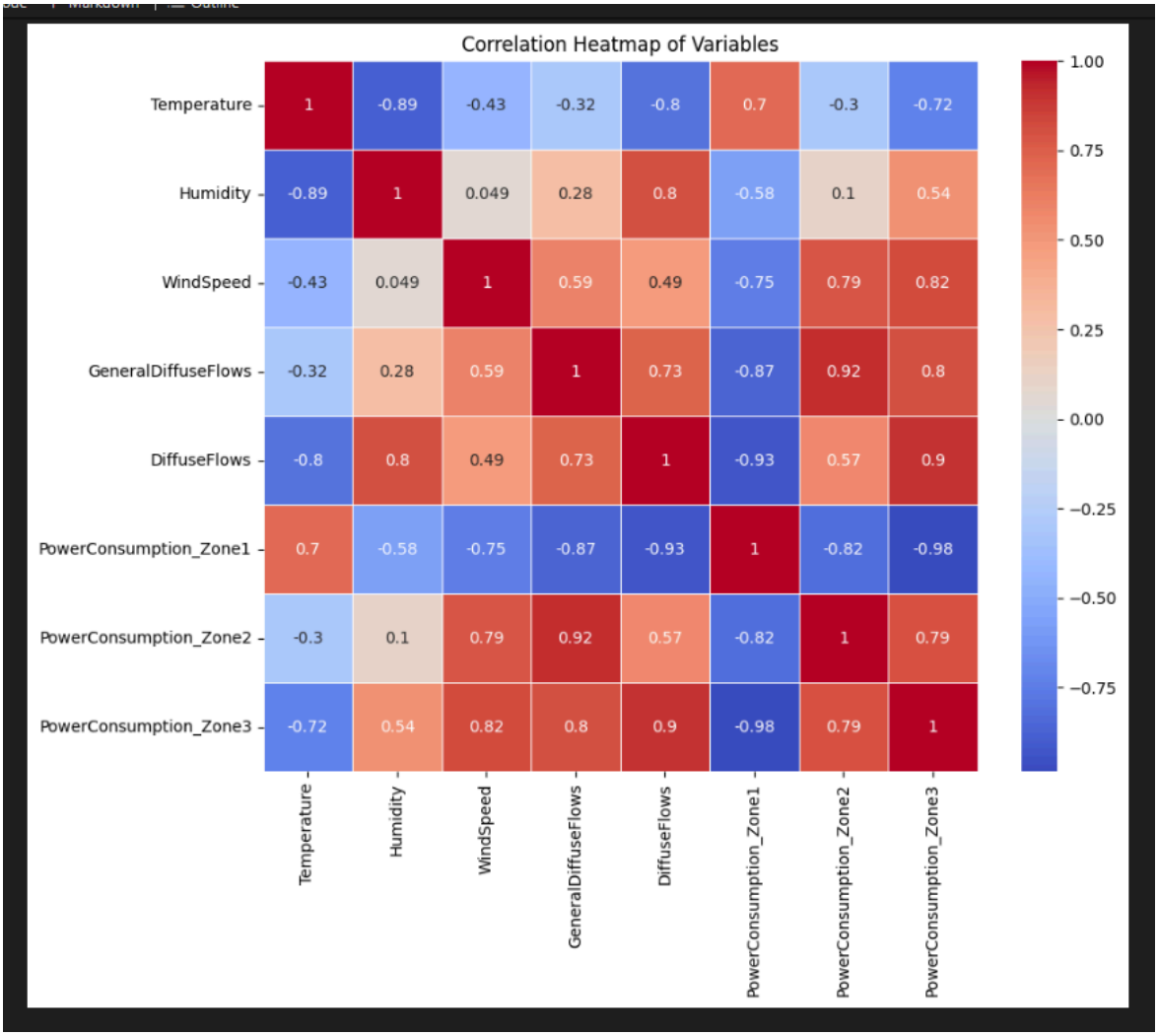
```
     Building  PowerConsumption_Zone1  PowerConsumption_Zone2  \
0  Building A                    1500                    1200
1  Building B                    2200                    1900
2  Building C                    1800                    1500
3  Building D                    2500                    2200

   PowerConsumption_Zone3
0                    1000
1                    1600
2                    1300
3                    1900
```



Plot Heatmap:

```python
# Plot heatmap
plt.figure(figsize=(10, 8))
sns.heatmap(corr_matrix, annot=True, cmap='coolwarm', linewidths=0.5)
plt.title('Correlation Heatmap of Variables')
plt.show()
```

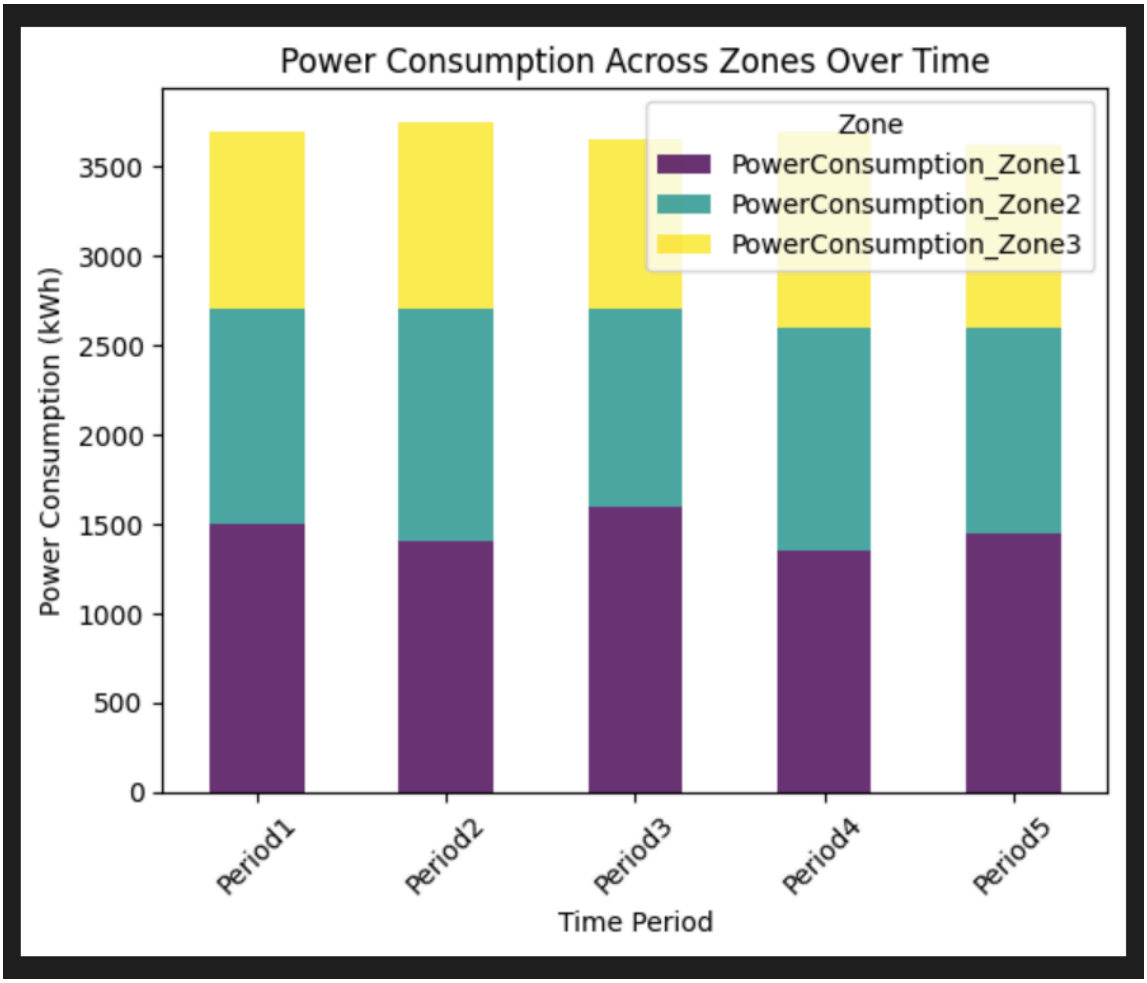
Output:



Plot stacked column chart:

```
# Plot stacked column chart
plt.figure(figsize=(10, 6))
df.plot(kind='bar', stacked=True, colormap='viridis', alpha=0.8)

# Adding labels and title
plt.title('Power Consumption Across Zones Over Time')
plt.xlabel('Time Period')
plt.ylabel('Power Consumption (kWh)')
plt.xticks(rotation=45)  # Rotate x-axis labels for better visibility
plt.legend(title='Zone')

# Display the stacked column chart
plt.show()
```

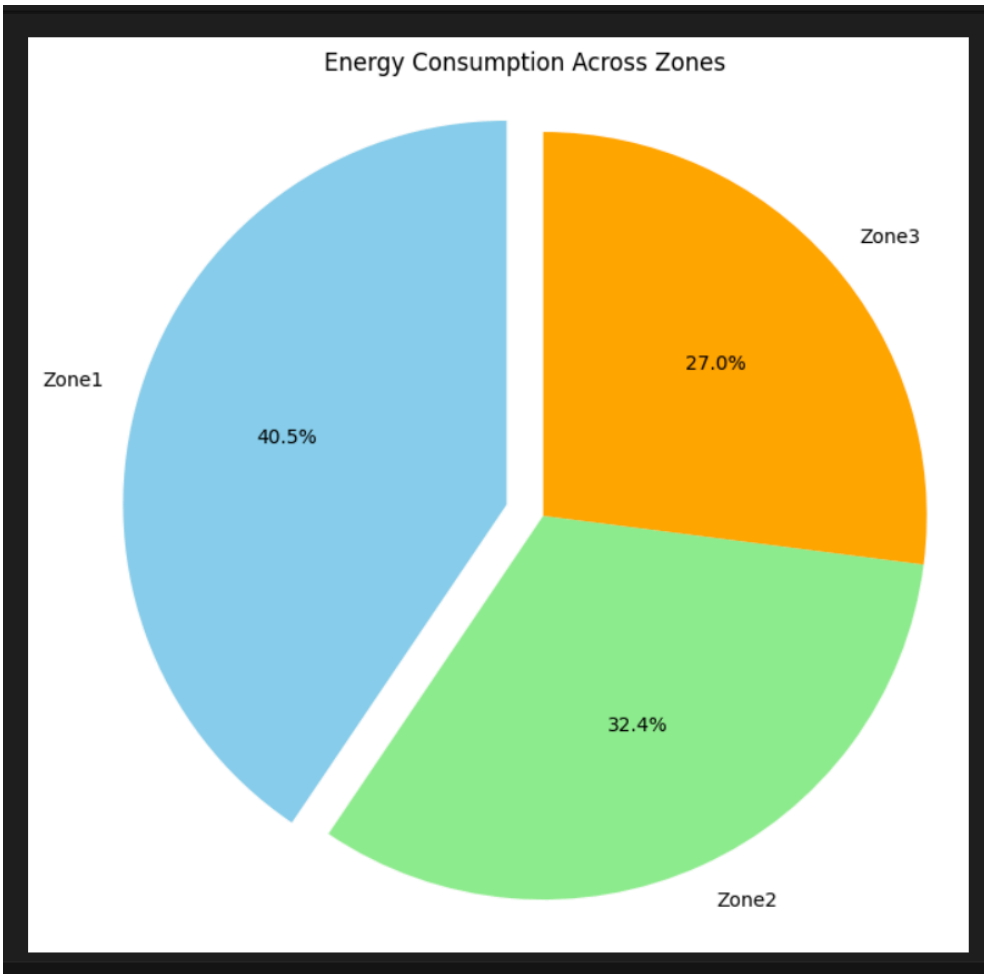
Output:



Pie chart:

```
# Plot pie chart
plt.figure(figsize=(8, 8))
plt.pie(df['PowerConsumption'], labels=df['Zone'], autopct='%1.1f%%', startangle=90,
    colors=['skyblue', 'lightgreen', 'orange'], explode=(0.1, 0, 0))
plt.title('Energy Consumption Across Zones')

# Display the pie chart
plt.axis('equal')  # Equal aspect ratio ensures that pie is drawn as a circle
plt.show()
```

Output:



GitHub Link :

https://github.com/kavimugil18/ibmproject.git